01 Inter. Jurn. Compt Vol 34 No 1 2019 Edi Faizal, Sumiyatun, Sudarmanto-pages-6-21.pdf

International Journal of Computer
(IJC)
ISSN 2307-4523 (Print & Online)

http://ijcjournal.org/

Classification of Students Based on Academic Ability Using Profile Matching and Linear Interpolation Weighting

Edi Faizal[a]*, Sumiyatun[b], Sudarmanto[c]

[a,c] *Department of Informatics Management, STMIK AKAKOM Yogyakarta, Indonesia*
[b] *Department of Informatics Engineering, STMIK AKAKOM Yogyakarta, Indonesia*
[a]*Email: edifaizal@akakom.ac.id,* [b]*Email: sumiyatun@akakom.ac.id,* [c]*Email: darmanto@akakom.ac.id*

Abstract

Higher education institutions play an important role in learning activities, both academic and non-academic, including establishing a social transition to adjust to the Fourth Industrial Revolution (4IR). Higher education in Indonesia is generally divided into classes with heterogeneous characteristics that cause less conducive teaching and learning process. Clustering of students in a particular group (homogeneous) is expected to improve acceleration and effectiveness of learning. Multicriteria analysis needs to be done to avoid errors of judgment in the determination of the class. Selection methods may affect the quality of the resulting decisions. This research profile matching method applying in determining the clustering of students, which is assessed based on the ideal profile of a superior class. The criteria that form the basis of assessment is the value of two semesters learning achievement in the first year, the value of the course, the expertise, and mastery of programming languages as well as activity in the organization's activities. Weighting difference in value (gap) with a certain range is calculated using linear interpolation. Output in the form of a ranking system that helps decision-makers to the cluster of students accurately and efficiently.

Keywords: DSS; Clustering; Profile Matching; Academic Ability; Linear Interpolation.

1. Introduction

Higher Education (HE) has an important role to shape the social transition to adjust to the Fourth Industrial Revolution (4IR)[1][2], Institutions of higher education are responsible for learning activities both academic and non-academic[3], The role of higher education determine the development of human resources with the ability of hard skills and soft skills are reliable, so the need to identify students who have both[4]

Higher education in Indonesia is generally divided into classes with heterogeneous characteristics. A class consists of students classified as intelligent and creative, but there are students with less well academically

* Corresponding author.

capable. Whether or not conducive to the learning process that takes place in a classroom at least influenced by two things, the faculty, and students, so that the clustering of students in a particular group (homogeneous) is expected to increase the effectiveness of learning[5][6][7].

Decision support system (DSS) is part of the computer-based information systems used to support decision-making[3], Decision support models built to help decision-makers evaluate the consequences of various alternatives[8][9][10][11], Decision-making can be done, either with the structured data and unstructured[12], The development of a decision support system can be done with three alternative methods to represent knowledge, namely model-based, rule-based and case-based. Unlike model-based and rule-based, which uses certain rules and models, case-based uses of previous cases to resolve new cases[13][14] [15].

Multiple criteria decision making (MCDM) is mostly used in ranking one or more alternatives from the finite set of available alternatives[16][17], There are many methods that can be used in developing a decision support system, including SAW, AHP, TOPSIS, SMART and Profile Matching are the most frequently used methods[18],

Multicriteria analysis needs to be done to avoid errors in judgment[19], Selection methods may affect the quality of the resulting decisions. This research profile matching method applying the method in determining the clustering of students, which is assessed based on the ideal profile of a superior class. The criteria that form the basis of assessment is the value of the initial two-semester learning achievement, the values of the subjects, expertise, and mastery of programming languages and liveliness in the activities of the organization. Value subjects were divided into two groups, namely the core subjects and subject groups of supporters. The output of information systems that help stakeholders to make decisions for the clustering of students. The use of a decision support system is intended to (1) help make decisions for semi-structured problems; (2) provide support consideration; (3) improve the effectiveness of the decisions taken; (4) the speed of computing; (5) increasing productivity; (6) support quality; (7) competitive and (8) to overcome cognitive limitations[17].

2. Proposed methodology

2.1. Related Work

Research in developing decision support systems have been carried out using various methods. Research to develop a decision support system for the selection of outstanding students[4], Calculations performed by the method of analytical hierarchy process (AHP). Components assessed the cumulative IP with a weighting of 20%, papers with a weight of 30%, co-curricular and extracurricular by weight 25%, and assessment of English/foreign languages with a weight of 25%.

The number of processes on the app selection of outstanding students that I process input data assessed criteria. Process II namely student input data, process input data III student grades. IV process input value comparison of each criterion. The final process is to do calculations and sorting the total value of the highest value to the lowest achieving students to rank.

Research to build a decision support system for the distribution of superior classes of new students at STM Raksana Medan [20]. The criteria used as the basis of the assessment were obtained from the Raksana education foundation, namely the average value of junior high school report cards, the average national exam junior high school, taking the selection test (consisting of general knowledge, Indonesian, English and mathematics).

Implementation of a decision support system that leading class division using Promethee so the order of prospective students who apply starting from the highest to the lowest with the value calculation does leaving flow, entering flow and net flow.

Research to create a decision support system for the determination of the best students at the University of Muhammadiyah Purwokerto[20], The method used is the weighted product (WP). Assessment is based on cumulative grade index, papers, achievement/ability underdog and English language skills.

Research using profile matching method for determining the rotation of the transfer of personnel[21], Assessment is based on two aspects: the intellectual capacity and employment aspects. Aspects of intellectual capacity in value-based education, verbalization idea, systematic thinking, reasoning, and real solutions, concentration, practical logic, the flexibility of thinking, the creativity of imagination, anticipation and intelligence potential. while research[12], Apply a profile matching to assess the best employees. Four criteria used in the assessment of that work performance, attitude and personality, teamwork and intellectual capacity. Based on the assessment of the 10 employees, the calculation method is able to determine the employees' profile matching the best.

2.2. Dataset

In this study discusses the determination of decision support systems based clustering featured student academic profile. Clustering is done for bachelor's degree students, chosen because it has a parallel class. There are two tracks, namely bachelor's degree majoring in Computer Science and Information Systems department. While majoring Diploma not be used as material for analysis has only one class per batch.

The research data used is the first year students (first and second semesters). The calculation is performed by comparing the ideal profile and criteria of students' academic profile. The assessment is based on several criteria with the corresponding percentage rate of interest, as presented in Table 1.

Table 1: Criteria for assessment

No	*Criteria (%)*	*Code of Sub-Criteria*
1	First Semester Achievement Index (15%)	IP1
2	Second Semester Achievement Index (15%)	IP2
3	Grade of the course (40%)	AP1, AP2, MNM, MIF, DBD, DBM, EN1, EN2, STT
4	Expertise (20%)	DSK, WEB, MBL, DBA, DSG
5	Organization (10%)	SCN, SCL, RLG

The meaning of code of sub-criteria are AP1: Algorithms and Programming1, AP2: Algorithms and Programming 2, MNM: Numerical Method, MIF: Mathematical Informatics, DBD: Database Design, DBM: Database Management, EN1: English 1, EN2: English 2, STT: Statistics, DSK: Desktop programming, WEB:

Web Programming, MBL: Mobile Programming, DBA: Database Administration, DSG: Graphic Design, SCN: Scientific Organization, SCL: Social Organization, and RLG: Religious Organization.

Each criterion has a range of values that vary between one and other criteria. Semester achievement index (IP1 and IP2) value ranges are divided into 3 categories: less (≤2.25), Good (> 2.25 and <3.25), Satisfy (≥3.25), as presented in Table 2.

Table 2: Range of achievement index criteria

Range of Values	*Define*
≤ 2:25	Less
> 2:25 and <3:25	Good
≥3.25	Satisfy

As for the criteria grade of the course, the value is divided into 4 categories on a scale of 1-4. Value has the highest weight is 4, while the value of D is given the lowest weight that is 1, as presented in Table 3.

Table 3: Range grade of the course criteria

Grade	***Define***	***Weight***
A	Satisfy	4
B	Good	3
C	Enough	2
D	Less	1

Assessment criteria for membership are divided into three, namely beginner, intermediate and advanced with a weight between 1-3 (Table 4). Sub-criteria used in the assessment of expertise consists of 5 sub-criteria, which are divided into three core factors and two secondary factors.

Table 4: Range expertise criteria

Level	***Weight***
Beginner	1
Intermediate	2
Advanced	3

While the weighting of the criteria the organization in value based on the amount of participation in the activities of the organization with the weight of 1-3 (Table 5).

Table 5: Range of organizational criteria

Value	***Weight***
Nothing	1
1 Activity	2
> 1 Activity	*3*

This criterion consists of three sub-criteria: scientific organization (core factor), social organizations and religious organizations (secondary factor).

2.3. Profile Matching method

The process of calculating the Profile Matching method, starting with defining the minimum value for each variable assessment. Difference testing each data value to the minimum value of each variable, a gap which is then given weight.

The weight of each variable average will be calculated based on groups of variables Core Factor (CF) and Secondary Factor (SF). The composition of CF plus SF is 100%, depending on the interests of users of this method. The final stage of this method is the process of accumulation of CF and SF value based on the values of testing data variables. Step-by-step method of profile matching

2.3.1. Mapping profile Gap

The Gap is the difference value of each criterion/attribute with a target value. For example, the difference value with the value Student Profile ideal profile. Calculation using equation (1).

$$\gamma = \alpha - \beta \tag{1}$$

where γ is the value of the difference (gap), Whereas the criteria value α and β ideal profile is a profile value that students will be assessed.

2.3.2. Assign Gap weights value

Profile matching process outlines a process to compare between each criterion in order to know the difference score, the smaller the gap the greater the weight value. Gap value can be calculated using equation (1). Weighting value gap to the criteria of the exact value is determined based on Table 6.

Table 6: Weight of gap value

Difference	*Weight*	*Define*
0	4	There was no difference
1	3.5	Competence individual excess 1 level
-1	3	Competence individual shortage 1 level
2	2.5	Competence individual excess of 2 levels
-2	2	Competence individual shortage 2 levels
3	1.5	Competence individual excess of 3 levels
-3	1	Competence individual shortage of 3 levels

While the criteria with the value in a particular range (achievement index criteria semesters), weights are calculated using linear interpolation (equation 2)

$$f(x) = \frac{y_2 - y_1}{x_2 - x_1}(x - x_1) + y_1 \tag{2}$$

Where *f(x)*is the value of the point sought, while y_2y_1 in the upper limit and lower limit. x_2 upper limit value and x_2 is the lower limit value, while x is the value of the point sought.

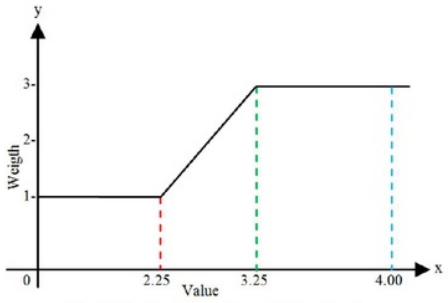

Fig 1. Graph a linear interpolation function

Where:

$$f(x) = \begin{cases} 3, & if\ x \geq 3.25 \\ \frac{3-1}{3.25-2.25}(x-2.25)+1, & if\ 2.25 < x < 3.25 \\ 1, & if\ x \leq 2.25 \end{cases}$$

f(x) worth 3 if $x \geq 3.25$ and a value of 1 if $x \leq 2.25$. whereas if x is between them, then *f(x)* can be calculated using the (equation 2).

2.3.3. Calculation and grouping

Core Factor is the most important criterion or most needed in an assessment to obtain optimal results (Equation 3).

$$CF = \frac{\sum_{i=1}^{j} NC_i}{\sum_{m=1}^{n} IC_m} \quad (3)$$

Where CF is the average value of all the criteria of the core factor, NC is the total value of the criteria and IC core factor is the number of items core factor criteria.

Secondary Factor while the items other than that of the core factors that is a supporting factor in the assessment (equation 4). Where SF is the average value of all the criteria of a secondary factor, NS is the total number of secondary factors and IS value is the number of items secondary factor criteria.

$$SF = \frac{\sum_{i=1}^{j} NS_i}{\sum_{m=1}^{n} IS_m} \quad (4)$$

After the calculation process CF and SF, each criterion then calculated the total value (TC) of each criterion based on the percentage which uses 60% CF and SF 40%. TC calculated using equation (5).

$$TC = (x\%)CF + (y\%)SF \quad (5)$$

Where *TC* is the total value of the criteria, *x* is the value of the percentage of core factors and *y* is the percentage of the value of SF. The value of *x* is 60% while *y* 40%.

2.3.4. The final result of the profile matching process

Ranking sorted by the highest final scores an alternative. Calculation of the final value of a calculated alternative uses equation (6).

$$NF = \sum_{t=1}^{n} p\%(TC_t) \quad (6)$$

Where *NF* is the end value is calculated based on the sum of the value of each criterion. Each criterion has a percentage (*p*) which differ according to the level of importance of these criteria (see Table 1).

3. Experiment

Several steps need to be done to make the process of student clustering are following the 6 steps.

3.1. Define variables required data

The data used is the profile of students who are studying in the first year. As an alternative to using as many as 30 students sample data (table 7).

Table 7: Alternative (students)

Code	*Name*	*Code*	*Name*	*Code*	*Name*
SID001	Chandra	SID011	Stevandi	SID021	Firm
SID002	Banner	SID012	Labay	SID022	Indrawan
SID003	Indra	SID013	Akbar	SID023	Ranindya
SID004	Rajie	SID014	Ardina	SID024	Ihwan
SID005	Serlina	SID015	Rezha	SID025	Makarno
SID006	Denny	SID016	Misbakhul	SID026	John
SID007	Vivi	SID017	Burhanuddin	SID027	Aprianus
SID008	Agudimus	SID018	Hilman	SID028	Farhan
SID009	Hariadiyatma	SID019	Sun	SID029	Risaldy
SID010	Mercy	SID020	Aksa	SID030	Merzy

3.2. Identify criterion that are used for assessment

There are five aspects of performance index used is the 1st-semester, 2nd-semester achievement index, course grades, expertise, and organization. Every aspect has a different percentage of interests as presented in Table 1. Data class expected ideal profile as presented in Table 8.

Table 8: Ideal profile of class (**core factors)*

No	*Criteria*	*Value*	*No*	*Criteria*	*Value*
1	IP1 *	satisfy	10	EN2	B
2	IP2 *	satisfy	11	STT	B
3	AP1 *	A	12	DSK *	intermediate
4	AP2 *	A	13	WEB *	intermediate
5	MNM *	A	14	MBL *	advanced
6	MIF *	A	15	DBA	beginner
7	DBD *	A	16	DSG	intermediate
8	DBM *	A	17	SCN *	1 Activity
9	EN1	B	18	SCL	1 Activity

For example will use 5 (SID01-SID05) alternate data samples used in the calculation, as presented in Table 9.

Table 9: The data of alternative

Criteria	*SID01*	*SID02*	*SID03*	*SID04*	*SID05*
IP1 *	3.25	2.75	3.5	3.45	2.13
IP2 *	3	3.1	3.65	3.51	2,27
AP1 *	A	B	A	B	B
AP2 *	A	B	A	A	C
MNM *	B	C	A	A	B
MIF *	A	B	B	B	A
DBD *	B	B	A	A	B
DBM *	B	A		B	C
EN1	A	B	B	B	C
EN2	B	B	B	A	B
STT	A	B	B	A	B
DSK *	beginner	intermediate	intermediate	advanced	beginner
WEB *	advanced	advanced	advanced	intermediate	advanced
MBL *	intermediate	beginner	advanced	advanced	intermediate
DBA	intermediate	intermediate	beginner	beginner	beginner
DSG	advanced	intermediate	advanced	advanced	beginner
SCN *	> 1 activity	1 activity	> 1 activity	1 activity	1 activity
SCL	1 activity	nothing	nothing	1 activity	1 activity
RLG	nothing	1 activity	1 activity	nothing	nothing

3.3. Mapping Gap and weighing the Gap value

Criteria for achievement index semester and weights are calculated using linear interpolation (equation 2). As an example calculation is as follows:

First Semester Achievement Index (IP1):

- SID01

  IP-1 value of 3.25 by function in equation 2 then its weight is 3

- SID02

  IP-1 with a value of 2.75, it can be calculated as follows

  $$f(2.75) = \frac{3-1}{3.25-2.25}(2.75-2.25)+1$$

  $$= \frac{2}{1}(0.5)+1 = 2$$

- SID03

  IP-1 value of 3.5 based function in equation 2 then its weight is 3

- SID04

  IP-1 value of 3.45 by function in equation 2 then its weight is 3

- SID05

  IP-1 with a value of 2.13, it can be calculated as follows

  $$f(2.13) = \frac{3-1}{3.25-2.25}(2.13-2.25)+1$$

  $$= \frac{2}{1}(-0.12)+1 = 0.76$$

Second Semester Achievement Index (IP2):

- SID01

  IP-2 with a value of 3.05, it can be calculated as follows

$$f(3.05) = \frac{3-1}{3.25-2.25}(3.05-2.25)+1$$

$$= \frac{2}{1}(0.8)+1 = 2.6$$

- SID02

  IP-2 with a value of 3.1, it can be calculated as follows

$$f(3.1) = \frac{3-1}{3.25-2.25}(3.1-2.25)+1$$

$$= \frac{2}{1}(0.85)+1 = 2.7$$

- SID03

  IP-2 value of 3.65 by function in equation (2) then its weight is 3

- SID04

  IP-2 value of 3.51 by function in equation (2) then its weight is 3

- SID05

  IP-2 with a value of 2.27, it can be calculated as follows

$$f(2.27) = \frac{3-1}{3.25-2.25}(2.27-2.25)+1$$

$$= \frac{2}{1}(0.02)+1 = 1.04$$

The same calculation is done for each IP1 nd IP2 at every alternative weight as shown in Table 10.

Table 10: IP1 and IP2 weight

Alternative	*IP1*	*IP2*
SID01	3	2.6
SID02	2	2.7
SID03	3	3
SID04	3	3
SID05	0.76	1.04

In addition to the criteria of the semester achievement index (IP1 and IP2), mapping GAP calculated using (equation 1) and weights refer to table 6. The results of the calculations gap grade of the course expertise and organization can be seen in Table 11, Table 12 and Table 13. And the Weighting for each gap can be seen in Table 14, Table 15 and Table 16.

Table 11: The gap of grade of the course

Alternative	*AP1*	*AP2*	*MNM*	*MIF*	*DBD*	*DBM*	*EN1*	*EN2*	*STT*
SID01	4	4	3	4	3	3	4	3	4
SID02	3	3	2	3	3	4	3	3	3
SID03	4	4	4	3	4	4	3	3	3

SID04	3	4	4	3	4	3	3	4	4
SID05	3	2	3	4	3	2	2	3	3
Required Value	4	4	4	4	4	4	3	3	3
SID01	0	0	-1	0	-1	-1	1	0	1
SID02	-1	-1	-2	-1	-1	0	0	0	0
SID03	0	0	0	-1	0	0	0	0	0
SID04	-1	0	0	-1	0	-1	0	1	1
SID05	-1	-2	-1	0	-1	-2	-1	0	0

Table 12: The gap of skills

Alternative	*DSK **	*WEB **	*MBL **	*DBA*	*DSG*
SID01	1	3	2	2	3
SID02	2	3	1	2	2
SID03	2	3	3	1	3
SID04	3	2	1	1	3
SID05	1	3	2	1	1
Required Value	2	2	3	1	2
SID01	-1	1	-1	1	1
SID02	0	1	-2	1	0
SID03	0	1	0	0	1
SID04	1	0	-2	0	1
SID05	-1	1	-1	0	-1

Table 13: The gap of organizations

Alternative	*SCN*	*SCL*	*RLG*
SID01	3	2	1
SID02	2	1	2
SID03	3	1	2
SID04	2	2	1
SID05	2	2	1
Required Value	2	2	2
SID01	1	0	-1
SID02	0	-1	0
SID03	1	-1	0
SID04	0	0	-1
SID05	0	0	-1

Table 14: Weight of grade of the course

Alternative	*AP1*	*AP2*	*MNM*	*MIF*	*DBD*	*DBM*	*EN1*	*EN2*	*STT*
SID01	5	5	4	5	4	4	4.5	5	4.5
SID02	4	4	3	4	4	5	5	5	5
SID03	5	5	5	4	5	5	5	5	5
SID04	4	5	5	4	5	4	5	4.5	4.5
SID05	4	3	4	5	4	3	4	5	5

Table 15: Weight of the expertise

Alternative	*DSK*	*WEB*	*MBL*	*DBA*	*DSG*
SID01	4	4.5	4	4.5	4.5
SID02	5	4.5	3	4.5	5
SID03	5	4.5	5	5	4.5
SID04	4.5	5	3	5	4.5
SID05	4	4.5	4	5	4

Table 16: Weight of the organization

Alternative	*SCN*	*SCL*	*RLG*
SID01	4.5	5	4
SID02	5	4	5
SID03	4.5	4	5
SID04	5	5	4
SID05	5	5	4

3.4. Calculation and grouping

This study uses multiple core factor and secondary factor in some criterion, as presented in Table 17.

Table 17: Distribution of CF and SF criteria

Criteria	*CF*	*SF*
Courses	AP1, AP2, MNM, MIF, DBD, DBM	EN1, EN2, STT
Expertise	DSK, WEB, MBL	DBA, DSG
Organization	SCN	SCL, RLG

After a gap of known weight value next is to perform the calculation and grouping core factors and secondary factors by using equation (3) and equation (4). The process of calculating core factors and secondary factors are as follows:

Grade of the course criteria:

- SID01

$$CF=\frac{5+5+4+5+4+4}{6}=\frac{27}{6}=4.5$$

$$SF=\frac{4.5+5+4.5}{3}=\frac{14}{3}=4.67$$

- SID02

$$CF=\frac{4+4+3+4+4+5}{6}=\frac{24}{6}=4.00$$

$$SF=\frac{5+5+5}{3}=\frac{15}{3}=5.00$$

- SID03

$$CF=\frac{5+5+5+4+5+5}{6}=\frac{29}{6}=4.83$$

$$SF=\frac{5+5+5}{3}=\frac{15}{3}=5$$

- SID04

$$CF = \frac{4+5+5+4+5+4}{6} = \frac{27}{3} = 4.5$$

$$SF = \frac{5+4.5+4.5}{3} = \frac{14}{3} = 4.67$$

- SID05

$$CF = \frac{4+3+4+5+4+3}{6} = \frac{23}{6} = 3.83$$

$$SF = \frac{5+4+5}{3} = \frac{14}{3} = 4.67$$

Table 18: CF and SF on the grade of the course

Alternative	*CF*	*SF*
SID01	4.50	4.67
SID02	4.00	5.00
SID03	4.83	5.00
SID04	4.50	4.67
SID05	3.83	4.67

Expertise criteria:

- SID01

$$CF = \frac{4+4.5+4}{3} = \frac{12.5}{3} = 4.17$$

$$SF = \frac{4.5+4.5}{2} = \frac{9}{2} = 4.5$$

- SID02

$$CF = \frac{5+4.5+3}{3} = \frac{12.5}{3} = 4.17$$

$$SF = \frac{4.5+5}{2} = \frac{9.5}{2} = 4.75$$

- SID03

$$CF = \frac{5+4.5+5}{3} = \frac{14.5}{3} = 4.83$$

$$SF = \frac{5+4.5}{2} = \frac{9.5}{2} = 4.75$$

- SID04

$$CF = \frac{5+4.5+3}{3} = \frac{12.5}{3} = 4.17$$

$$SF = \frac{4.5+5}{2} = \frac{9.5}{2} = 4.75$$

- SID05

$$CF = \frac{4+4.5+4}{3} = \frac{12.5}{3} = 4.17$$

$$SF = \frac{5+4}{2} = \frac{9}{2} = 4.5$$

Table 19: CF and SF on expertise

Alternative	*CF*	*SF*
SID01	4.17	4.50
SID02	4.17	4.75
SID03	4.83	4.75
SID04	4.17	4.75
SID05	4.17	4.50

Organizational criteria:

- SID01

$$CF = \frac{4.5}{1} = 4.5$$

$$SF = \frac{5+4}{2} = \frac{9}{2} = 4.5$$

- SID02

$$CF = \frac{5}{1} = 5$$

$$SF = \frac{4+5}{2} = \frac{9}{2} = 4.5$$

- SID03

$$CF = \frac{4.5}{1} = 4.5$$

$$SF = \frac{4+5}{2} = \frac{9}{2} = 4.5$$

- SID04

$$CF = \frac{5}{1} = 5$$

$$SF = \frac{5+4}{2} = \frac{9}{2} = 4.5$$

- SID05

$$CF = \frac{5}{1} = 5$$

$$SF = \frac{5+4}{2} = \frac{9}{2} = 4.5$$

Table 20: CF and SF on organizations

Alternative	*CF*	*SF*
SID01	4.5	4.5
SID02	5	4.5
SID03	4.5	4.5
SID04	5	4.5
SID05	5	4.5

3.5. Total Value Calculation (TC)

The total value derived from the percentage of core factors and secondary factor, where CF = 60% and SF = 40%. After CF and SF have been calculated, the next is to calculate the TC value for each alternative using equation (5).

Grade of the course:

SID01 TC = (0.6 * 4.5) + (0.4 * 4.67) = 4.57

SID02 TC = (0.6 * 4) + (0.4 * 5) = 4.40

SID03 TC = (0.6 * 83) + (0.4 * 5) = 4.9

SID04 TC = (0.6 * 4.5) + (0.4 * 4.67) = 4.57

SID05 TC = (0.6 * 3.83) + (0.4 * 4.67) = 4.17

Expertise:

SID01 TC = (0.6 * 4.17) + (0.4 * 4.5) = 4.3

SID02 TC = (0.6 * 4.17) + (0.4 * 4.75) = 4.4

SID03 TC = (0.6 * 4.83) + (0.4 * 4.75) = 4.8

SID04 TC = (0.6 * 4.17) + (0.4 * 4.75) = 4.4

SID05 TC = (0.6 * 4.17) + (0.4 * 4.5) = 4.3

Organization:

SID01 TC = (0.6 * 4.5) + (0.4 * 4.5) = 4.5

SID02 TC = (0.6 * 5) + (0.4 * 4.5) = 4.8

SID03 TC = (0.6 * 4.5) + (0.4 * 4.5) = 4.5

SID04 TC = (0.6 * 5) + (0.4 * 4.5) = 4.8

SID05 TC = (0.6 * 5) + (0.4 * 4.5) = 4.8

3.6. Calculation of ranking

The final result of the profile matching process is ranking. TC counted after the last stage is to determine the final value for all alternatives based on all criteria of the assessment by the percentage as shown in Table 1. The calculation of the final value using equation (6) that:

- SID01
  NF = (0.15 * 3) + (0.15 * 2.6) + (0.40 * 4.57) + (0.20 * 4.3) + (0.1 * 4.5) = 3.98
- SID02
  NF = (0.15 * 2) + (0.15 * 2.7) + (0.40 * 4.40) + (0.20 * 4.4) + (0.1 * 4.8) = 3.83
- SID03
  NF = (0.15 * 3) + (0.15 * 3) + (0.40 * 4.90) + (0.20 * 4.8) + (0.1 * 4.5) = 4.27
- SID04
  NF = (0.15 * 3) + (0.15 * 3) + (0.40 * 4.57) + (0.20 * 4.4) + (0.1 * 4.8) = 4.09
- SID05
  NF = (0.15 * 0.76) + (0.15 * 1.04) + (0.40 * 4.17) + (0.20 * 4.3) + (0.1 * 4.8) = 3.28

At table 21 shows that students with Id SID03 with the highest score is ranked first at 4.27 to be included in the flagship class followed by the subsequent lower student. After calculating all the data (30 students), obtained a final value Table 22. Graph as an evaluation result as shown in Figure 2.

Table 21: The final value

Alternative	*NF*	*Rank*
SID01	3.98	3
SID02	3.83	4
SID03	4.27	1
SID04	4.09	2
SID05	3.28	5

Table 22: The final value of all alternative

Alternative	*NF*	*Ranking*	*Alternative*	*NF*	*Ranking*	*Alternative*	*NF*	*Ranking*
SID01	3.98	3	SID11	3.62	12	SID21	3.62	11
SID02	3.83	5	SID12	3.67	10	SID22	3.52	21
SID03	4.27	1	SID13	3.72	9	SID23	3.52	20
SID04	4.09	2	SID14	3.77	7	SID24	3.61	16
SID05	3.28	28	SID15	3.57	18	SID25	3.61	15
SID06	3.45	23	SID16	3.09	29	SID26	3.61	14
SID07	3.33	26	SID17	3.39	24	SID27	3.61	13
SID08	3.56	19	SID18	3.29	27	SID28	3.90	4

SID09	3.52	22	SID19	2.99	30	SID29	3.79	6
SID10	3.58	17	SID20	3.35	25	SID30	3.73	8

These rankings can be sorted according to the number of flagship-class capacity. In this study assumed a class has a capacity of 25 students featured. Based on Table 22, there are five students who can not get into the superior class that is SID07, SID18, SID05, SID16, and SID19 because it is ranked above 25.

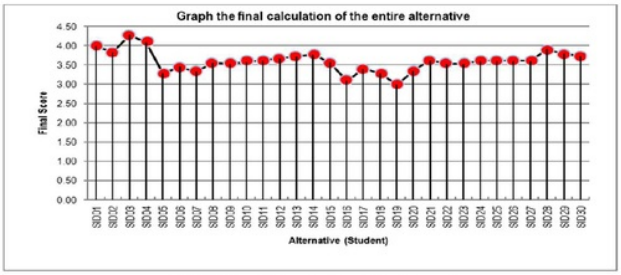

Fig 2. Graph the results of all alternative

4. Conclusions

Based on the stages of research that has been done, it can be concluded that the determination of the student clustering can be done using the application profile matching method. In assessing the criteria required by the ideal profile for the expected class. Calculation gap and weight to the criterion value can definitely direct reference to the weight table that has been provided in the profile matching method. But for criteria with a range of values need to use calculation and weighting gap with other methods. This study shows that the weighting using linear interpolation can be used in conjunction with a profile matching so that the calculation results are getting better and accurate.

References

[1] N. W. Gleason, *Higher Education in the Era of the Fourth Industrial Revolution*. 2018.

[2] N. W. Gleason, "Singapore's Higher Education Systems in the Era of the Fourth Industrial Revolution: Preparing Lifelong Learners," in *Higher Education in the Era of the Fourth Industrial Revolution*, 2018.

[3] H. B. Wicaksono and A. Dores, "International Journal of Computer Science and Mobile Computing Student Aspects Monitoring Using Profile Matching," *Int. J. Comput. Sci. Mob. Comput.*, vol. 7, no. 12, pp. 93–100, 2018.

[4] N. A. Sari, B. Widada, and T. Susyanto, "Penerapan Metode Analytical Hierarchy Process (AHP) Pada Sistem Pendukung Keputusan Pemilihan Mahasiswa Berprestasi Menggunakan Framework Laravel," *Script*, vol. 3, no. 1, pp. 49–57, 2015.

[5] S. O. Adodo and J. O. Abgayewa, "Effect of homogenous and heterogeneous ability grouping class teaching on students interest, attitude and achievement in integrated science," *Int. J. Psychol. Couns.*, 2011.

[6] M. Bahar, "Student Perception of Shift from Homogenous Grouping to Heterogeneous Grouping at a University Class," *Procedia - Soc. Behav. Sci.*, 2012.

[7] J. A. Riordan, "Perceptions of secondary school teachers in regard to heterogeneous and homogeneous grouping practices," 1994.

[8] L. Uusitalo, A. Lehikoinen, I. Helle, and K. Myrberg, "An overview of methods to evaluate uncertainty of deterministic models in decision support," *Environ. Model. Softw.*, vol. 63, pp. 24–31, 2015.

[9] M. E. Borsuk, C. A. Stow, and K. H. Reckhow, "A Bayesian network of eutrophication models for synthesis, prediction, and uncertainty analysis," *Ecol. Modell.*, 2004.

[10] N. Fenton and M. Neil, *Risk assessment and decision analysis with bayesian networks*. 2012.

[11] A. Holzkämper, V. Kumar, B. W. J. Surridge, A. Paetzold, and D. N. Lerner, "Bringing diverse knowledge sources together - A meta-model for supporting integrated catchment management," *J. Environ. Manage.*, 2012.

[12] Oktopanda, "A Study Approach of Decision Support System with Profile Matching," *Int. J. Recent Trends Eng. Res.*, vol. 03, no. 02, pp. 31–44, 2017.

[13] T. V Avdeenko and E. S. Makarova, "The case-based decision support system in the field of IT-consulting," *Int. Conf. Inf. Technol. Bus. Ind.*, pp. 1–6, 2016.

[14] T. V Avdeenko and E. S. Makarova, "Integration of Case-based and Rule-based Reasoning Through Fuzzy Inference in Decision Support Systems Integration of case-based and rule-based reasoning through fuzzy inference in decision support systems," *Procedia - Procedia Comput. Sci.*, vol. 103, no. February, pp. 447–453, 2017.

[15] E. Faizal and H. Hamdani, "Weighted Minkowski similarity method with CBR for diagnosing cardiovascular disease," *Int. J. Adv. Comput. Sci. Appl.*, vol. 9, no. 12, 2018.

[16] A. Ishizaka and S. Siraj, "Are multi-criteria decision-making tools useful? An experimental comparative study of three methods," *Eur. J. Oper. Res.*, vol. 264, no. 2, pp. 462–471, 2018.

[17] P. L. Drnevich, T. H. Brush, and A. Chaturvedi, "Examining the Implications of Process and Choice for Strategic Decision Making Effectiveness," *Cris. Manag.*, vol. 17, pp. 344–359, 2013.

[18] B. W. Sari, "Perbandingan Metode Profile Matching dan Simple Additive Weighting Pada Penentuan Jurusan Siswa Kelas X SMA N 2 Ngaglik," *J. Ilm. DASI*, 2015.

[19] C. H. Primasari, R. Wardoyo, and A. K. Sari, "Integrated AHP, Profile Matching, and TOPSIS for selecting type of goats based on environmental and financial criteria," *Int. J. Adv. Intell. Informatics*, vol. 4, no. 1, p. 28, 2018.

[20] H. Mustafidah and H. N. Hadyan, "Sistem Pendukung Keputusan Penentuan Mahasiswa Berprestasi di Universitas Muhammadiyah Purwokerto Menggunakan Metode Weighted Product (WP) (Decision Support System of Excellent Student Determination in Universitas Muhammadiyah Purwokerto Using Weighted," *Juita*, vol. 5, no. 1, pp. 51–61, 2017.

[21] T. Susilowati, E. Y. Anggraeni, Fauzi, W. Andewi, Y. Handayani, and A. Maseleno, "Using Profile Matching Method to Employee Position Movement," *Int. J. Pure Appl. Math.*, 2018.

01 Inter. Jurn. Compt Vol 34 No 1 2019 Edi Faizal, Sumiyatun, Sudarmanto-pages-6-21.pdf

ORIGINALITY REPORT

8%

SIMILARITY INDEX

PRIMARY SOURCES

1	ijcjournal.org Internet	147 words	3%
2	Tulus Suryanto, Robbi Rahim, Ansari Saleh Ahmar. "Employee Recruitment Fraud Prevention with the Implementation of Decision Support System", Journal of Physics: Conference Series, 2018 Crossref	59 words	1%
3	S A Sitepu, S Efendi, Z Situmorang. "The gap values in the profile matching method by fuzzy logic", Journal of Physics: Conference Series, 2018 Crossref	55 words	1%
4	Sunarti, Rahmadian Y Rangga, Yulvia Nora Marlim. "Application Profile Matching Method for Employees Online Recruitment", IOP Conference Series: Earth and Environmental Science, 2017 Crossref	51 words	1%
5	Formal Modelling in Electronic Commerce, 2005. Crossref	33 words	1%
6	jacet.srbiau.ac.ir Internet	31 words	1%
7	Lecture Notes in Computer Science, 2012. Crossref	10 words	< 1%

EXCLUDE QUOTES	OFF	EXCLUDE MATCHES	< 1%
EXCLUDE BIBLIOGRAPHY	ON		